



T H E D E P A R T M E N T O F E N E R G Y

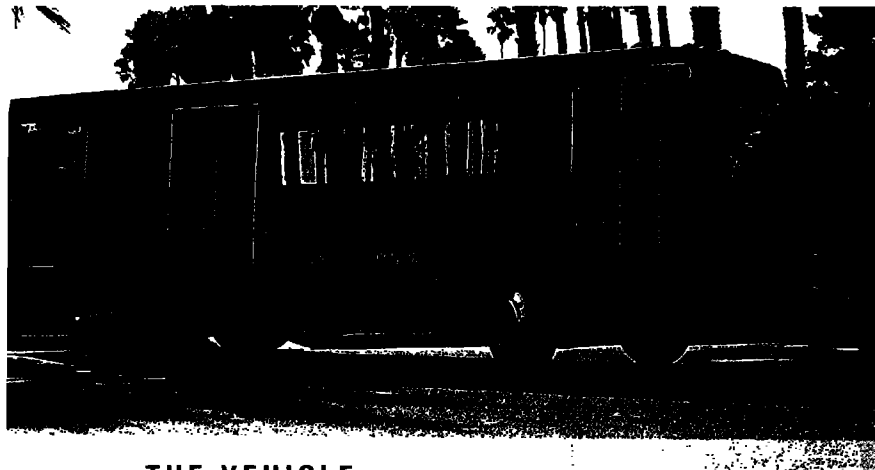
F U E L

C E L L

B U S

**The 30-foot
fuel-cell powered
electric transit bus provides
the same performance
as a diesel, but is much
cleaner and quieter.**

The first U.S. produced fuel cell transit bus.



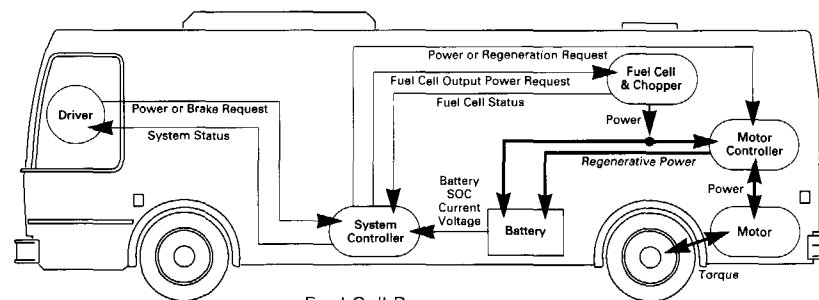
THE VEHICLE

The 30-foot fuel cell transit bus is a heavy-duty, extremely low-emission electric vehicle that meets or exceeds all transit industry and Americans with Disabilities Act requirements. It is designed to operate in all climates, traffic conditions, and on the majority of transit routes. Due to the fuel cell's high efficiency and low maintenance, the fuel cell bus is expected to have a lower life cycle cost than a low emission diesel bus. By combining a proven transit bus design with proven state-of-the-art fuel cell and electric drive technology the fuel cell bus will provide a cleaner, quieter, and lower cost form of mass transportation.

A fuel cell is a simple device that uses hydrogen and oxygen from the air, and combines them to form electricity and water vapor. To meet the average transit bus's range and rapid refueling requirements, a liquid fuel, methanol, is reformed to provide the required hydrogen for the fuel cell. The fuel cell bus employs the most highly developed type of fuel cell, a Phosphoric Acid Fuel Cell (PAFC). This type of fuel cell is in commercial operation at sites around the world.

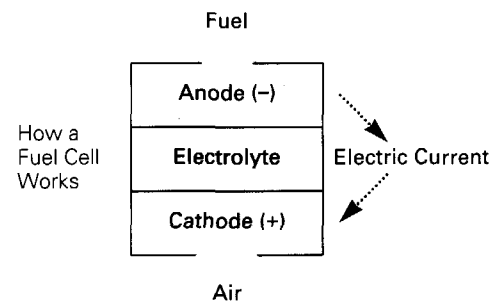
The 30-foot bus uses a 50 kW PAFC system to provide 100% of the energy needed to complete a day's transit mission. A battery pack is used to provide the peak power required for acceleration and hill climbing. As an additional benefit, the battery stores the energy recovered from regenerative braking resulting in reduced methanol consumption and extended brake life.

THE TECHNOLOGY



Fuel Cell Bus
Hybrid Power System

**The system controller
adjusts fuel cell output
based on the driver's
power requirement
and state of the
battery.**



**As can be seen
from the chart,
fuel cell emissions
are practically
zero.**

Fuel Cell vs. Diesel Emissions	CO	NOx	HC	PM
1993 Federal Emission Standard	15.5	5.0	1.3	0.1
1998 Federal Emission Standard	15.5	4.0	1.3	0.05
Fuel Cell Bus	0.35	0.01	0	0

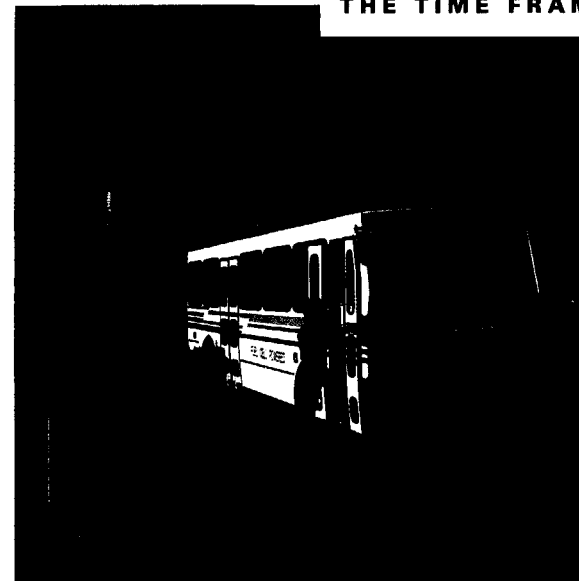
All units in g/bhp-hr

THE REASON

Even with stricter emissions standards on automobiles and industry, air pollution remains a major problem. Fuel cells offer a cleaner more efficient alternative to the internal combustion engine for all vehicles. These fuel cell powered buses demonstrate that an extremely low emission, fully functional transit bus can be built using production-ready and proven technology. As a first step to commercializing fuel cells, the fuel cell bus program will show that a fuel cell and electric drive can function cleanly, efficiently, and cost effectively in a transit bus. The fuel cell bus program will function as an entry point for fuel cell power in transportation.

The first of three fuel cell buses began testing in March 1994 with public demonstration in April 1994. The remaining two buses will be completed by the fall of 1994. After delivery to the DOE, each bus will be put into in-service testing in different parts of the country. This will allow transit properties to "shake-down" the buses in areas of varying climatic conditions and provide feedback to designers which will be incorporated into future fuel cell bus designs.

THE TIME FRAME



**The first
fuel cell
powered
transit bus
began
road tests
in March
1994.**

- Twice the efficiency of an internal combustion engine
- Significantly less CO2 produced than an internal combustion engine
- Much quieter than a diesel engine
- Rapid refueling due to the use of a liquid fuel
- Use of proven phosphoric-acid fuel-cell technology
- Extremely low emissions

FUEL CELL BUS TEAM

FUEL CELL BUS BENEFITS

U.S. Department of Energy – Office of Transportation Technologies
 U.S. Department of Transportation – Federal Transit Administration
 California – South Coast Air Quality Management District

Project Team

Prime Contractor	H-Power Corp., Belleville, NJ
Bus Chassis	Bus Manufacturing USA Inc., Santa Barbara, CA
Fuel Cell	Fuji Electric Company, Japan
Propulsion System	Soleq Corp., Chicago, IL
System Integration	Booz, Allen & Hamilton, Inc., Baltimore, MD
40ft Bus Program	Transportation Manufacturing Corp., Roswell, NM

Department of Energy
 Argonne National Laboratory
 Georgetown University

U.S. Department of Energy
 Office of Energy Efficiency
 and Renewable Energy
 Office of Transportation Tech
 1600 Independence Avenue
 Washington D.C. 20585
 202-586-8855

